Contribution ID: **14** Type: **Oral**

Forbidden spectral shapes: Implications to reactor-antineutrino anomaly

Tuesday, 3 July 2018 18:00 (30 minutes)

Highly-forbidden non-unique beta-decays are known to have electron-spectrum shapes which depend on the effective value of the axial vector coupling constant g_{A} [1, 2]. Resent calculations show that this is also the case for many first-forbidden non-unique decays. Moreover, the spectral shapes of first-forbidden $J^{+} \leftrightarrow J^{-}$ decays with $J \neq 0$ are found to depend also on the value of the axial-charge matrix element, which is known to be enhanced in nuclear medium due to meson-exchange effects [3, 4].

In the reactor-antineutrino analysis the beta decays contributing to the cumulative electron spectrum are usually assumed to have allowed spectral shapes. However, about 30 \% of these decays are actually first-forbidden. In some cases, like in the case of the ground-state-to-ground-state decay of ^{140}Cs (see figure), this is found to be a rather poor approximation. Based on the recent results, the use of the allowed-approximation can at least partially explain the so called reactor antineurtino anomaly.

Indico rendering error

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Session Classification: Parallel Session 1-8